NEMA STANDARDS PUBLICATION NO. WC 60.1

nema

Bar Coding Power and Control Wire and Cable Products

NEMA

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION ■ 1300 N. 17th Street, Rosslyn, Virginia 22209

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NEMA Standards Publication WC 60.1-1995

BAR CODING
POWER AND CONTROL WIRE AND CABLE PRODUCTS

Published by

National Electrical Manufacturers Association
1300 N. 17th Street, Suite 1847
Rosslyn, Virginia 22209

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FOREWORD

The NEMA Wire and Cable Division developed this standard to facilitate processing of materials in the most efficient manner. It is in alignment with current and foreseeable future needs of the industry. The requirements included herein have been developed taking into account standards that have been developed, by ANSI Accredited Standards Committees MH10 and X12, the Uniform Code Council, NEMA, National Electrical Manufacturers Representatives Association (NEMRA), and National Association of Electrical Distributors (NAED).

In the preparation of this standards publication, input from users and other interested parties has been sought and evaluated. Inquiries, comments, and recommended revisions should be submitted to:

Vice-President, Engineering
National Electrical Manufacturers Association
1300 N. 17th Street, Suite 1847
Rosslyn, Virginia 22209

Applications Note: Users must be aware that, depending on the diversity of products which they purchase and diversity of product distribution channels, they may receive wire and cable and other products encoded according to any of the encodations schemes recognized in WC 60.1 or WC 60.2. In that regard, in developing hardware and software systems necessary to support bar coding, users should ensure that their systems accommodate both approaches.

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SCOPE

This standard applies to power and control wire and cable products as specified below:

All types of solid dielectric insulated wires and cables including thermosetting (XLPE and rubber) and thermoplastic, single and multi-conductor, jacketed, sheathed, or armored for power and control applications.

Specifically included are the following cables types:

0 to 600 Volt

Airport Lighting Cable
Bus Drop Cable
Cables Multiplexed or Paralleled (With or Without Concentric Neutrals)
Cathodic Protection Cable
MC Metal Clad Cable
Messenger supported Wiring
MI Mineral Insulated Cable
Network Cable
Oil Well Cable, Armored and Unarmored
Pole and Bracket Cable
Power Cable
Secondary Underground Distribution
Service Drop and Secondary Cable
Submarine Power Cable
TC Tray Cable
Water Well Cable, Armored & Unarmored

601 to 15kV

Airport Lighting Cable
MC Metal Clad Cable
Messenger Supported Wiring
MV/MC Metal Clad Cable
MV Power Cable
Oil Well Cable, Armored & Unarmored Pole and Bracket Cable
Primary Underground Distribution Cables
Street Lighting Cable
Submarine Power Cable

15.1kV and Over

MV/MC Metal Clad Cable
Messenger Supported Wiring
MV Power Cable
Primary Underground Distribution Cables
Submarine Power Cable
Transmission Cable

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Control Cable

Fire Alarm Cable
Control Cable
ITC Instrumentation Tray Cable
MC Metal Clad Cable
Messenger Supported Wiring
Railroad Signal Cable
Submarine Control Cable
TC Tray Cable
Traffic Control and Signal Cable

Welding Cable

Varnished Cloth (All Voltages)

All types of cables insulated with varnished cloth or with varnished cloth combined with other insulation material intended for power and control use.

Paper Power Cable

Paper insulated cable of the types used for the transmission and distribution of electrical energy.

Mining and Earth-Moving Machinery Cable

a) Insulated cable used in power supply applications with mining and dredging machinery, as follows:
b) Bore hole and dredge cable, armored & unarmored, (all voltages).
c) Mining and earth-moving machine cable, including: mine locomotive reel cable; mine shuttle car cable; mine drill cable; mine cable, flat, round, single or multi-conductors type (W, G, G-GC, etc., (all voltages). Mine power feeder cable, (all voltages); Shovel cable, Types SHD and SHD-GC, (all voltages).

Specifically *excluded* are:

a) Wires and cables suitable for applications of 135°C and over primarily used for electronics, military, shipboard and aviation applications.

Flexible Cords and Cables

All fixture wire, appliance wires and flexible cords as so classified by the National Electrical Code, by Underwriters Laboratories, Inc. or by the Canadian Standards Association.

Shipboard Cable such as types IEEE-45, MIL C 24643 and MIL C 24640.

Building Wire and Cable, which is covered in NEMA Standard WC 60.2.

600 V Type MC Cable employing conductors 10 AWG and smaller, with four conductors or less, and used as a building wire, are covered by NEMA Standard WC 60.2; all other MC cable constructions are covered under this Standard.

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Section 1
REFERENCES

1.1 REFERENCES

The following organizations and/or publications may be useful in utilizing standardized product identification and bar coding techniques on power and control wire and cable products:

Automatic Identification Manufacturers, Inc. (AIM)
634 Alpha Road
Pittsburgh, PA 15238
Phone 412/963-8588
Fax 412/963-8753

Automatic ID Publications Guide

The Source Book

Uniform Symbol Specification for Code 39-1986

American National Standards Institute (ANSI)
11 West 42nd Street
New York, NY 10036
Phone 212/642-4900
Fax 212/302-1286

X3.182-1990 *Bar Code Print Quality*

Fact 1

Electronic Data Exchange (EDX)
1300 N. 17th Street, Suite 1847
Rosslyn, Virginia 22209
Phone: 703/841-3200
Fax: 703/841-3300

Electrical Industry Business Communications Guidelines

Implementing Product Identification and Bar Code Systems for the Electrical Wholesale Distribution Marketplace

Uniform Code Council, Inc. (UCC)
8163 Old Yankee Road, Suite J
Dayton, OH 45458
Phone: 513/435-3870
Fax: 513/435-4749

UPC Symbol Specification Manual (January 1992)

UPC Shipping Container Code and Symbol Specification Manual (September 1990)

Application Specification for the UCC-128 Serial Shipping Container Code: (With Symbol and Shipping Label Guidelines) (July, 1992)
UPC Universal Product Code Industrial and Commercial Guidelines (May 1994)

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UCC/EAN Application Identifier Standard (January 1993)

UPC Guidelines Manual (October 1990)

UPC Implementation Guide (December 1991)

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Section 2
SYMBOLOGY

2.1 SYMBOLOGIES

Either UCC/EAN Code 128 or AIM USS Code 39 shall be used to bar code data on power and control wire and cable products.

UCC/EAN Code 128 symbols as specified in this publication shall be in accordance with requirements specified in the publication Universal Product Code Industrial and Commercial Guidelines (May 1994) and this publication.

AIM USS Code 39 symbols as specified in this publication shall be in accordance with requirements of AIM's *Uniform Symbol Specification for Code 39-1986* and this publication.

Where conflicting requirements exist, the requirements specified in this publication shall take precedence.

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Section 3
PRODUCT IDENTIFICATION SCHEME AND DESCRIPTION OF THE DATA STRUCTURE

3.1 GENERAL

Requirements for data to be supplied with power and control cables vary from product to product and customer to customer. Almost any type of data can be encoded using UCC/EAN Code 128 or AIM USS Code 39. This standard defines required and optional data fields to be used in conjunction with tags or labels used on power and control wire and cable products.

3.1.1 UCC/EAN Application Identifiers and AIM FACT Data Identifiers

To facilitate database processing and reduce errors, the data fields defined and bar coded in accordance with the requirements of this publication shall be identified through the use of either UCC/EAN Application Identifiers or AIM FACT Data Identifiers.

3.1.1.1 UCC/EAN APPLICATION IDENTIFIERS

If UCC/EAN Code 128 has been selected as the bar code symbology to be used, a UCC/EAN Application Identifier (AI) shall be utilized as a prefix to the data field to identify the data following. Clarifications of commonly accepted uses of UCC/EAN application identifiers as they apply to the power and control cable industry, are given in Appendix 1.

NOTE—If you wish to add to the list contact the National Electrical Manufacturers Association.

3.1.1.2 FACT DATA IDENTIFIERS

If AIM USS Code 39 has been selected as the bar code symbology to be used, a data identifier developed by the Federation of Automated Coding Technology (FACT) shall be used as a prefix to the data field to identify the data following.

NOTE—The FACT-1 standard is now administered by ANSI Accredited Standards Committee MH 10.

Clarifications of commonly accepted uses of FACT Data Identifiers (DI's), as they apply to the power and control cable industry, are given in Appendix 1.

NOTE—If you wish to add to the list contact the National Electrical Manufacturers Association.

3.2 MANDATORY FIELDS

The manufacturer, product identification, and quantity shall be required as minimum information for the proper identification of any power and control cable product.

When bar coding using UCC/EAN Code 128 or USS AIM Code 39, information shall be presented in three different data fields, in the following order as they appear from top to bottom:

a) Manufacturer identification
b) Product identification
c) Quantity

3.2.1 Manufacturer Identification

The manufacturer shall be identified utilizing a six-digit manufacturers number assigned by the Uniform Code Council.

3.2.2 Product Identification

Each product shall have a unique alphanumeric product identification assigned by the manufacturer or customer.

3.2.3 Quantity

The quantity fields shall include the approved UCC/EAN Application Identifier (AI) (322) or FACT Data Identifier (DI) 7Q, followed by the quantity in feet.

Example:

(322)5000	for UCC/EAN 128
7Q*5000*FT	for AIM/USS Code 39

3.3 Optional Fields

Additional data fields shall be permitted as defined in Appendix 1. Such fields shall be identified utilizing the appropriate AI or DI.

3.4 Field Lengths

Data field lengths shall be as specified in FACT 1.

NOTE—The length of some of the common data fields used in the wire and cable industry are illustrated in Appendix 1.

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The maximum length of data fields shall not exceed the length specified in the ANSI X12 standards for electronic data communication.

3.5 Other Digits

The use of non-significant zeros in data fields shall not be permitted unless specifically required by UCC/EAN 128 or AIM USS Code 39.

3.6 Check Digits

When utilizing UCC/EAN Code 128, a check digit shall be utilized in accordance with the requirements of *UCC/EAN Code 128 Standards (January 1993).*

A check digit shall not be used when utilizing the AIM USS Code 39 symbology.

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Section 4
BAR CODE LABEL FORMAT

4.1 General

Labels shall be in the stack bar code format as illustrated in Figure 4-1 and shall include the mandatory fields specified in 3.2

Additional fields shall be placed below the mandatory fields in the stack bar code format.

4.2 Bar Code Symbol Dimensions

Symbol Dimensions shall be as specified for UCC/EAN Code 128 or AIM USS Code 39.

4.3 Bar Code Symbol Placement

The bar code symbol shall be left justified in the lower portion of the allotted space.

Stacked Horizontal Symbols—the symbols shall have a minimum separation of 0.25 inch (6.35mm) and a maximum separation of 0.75 inch (19.05 mm) as shown in Figure 4-1.

Stacked Vertical Symbols—the symbols shall have a minimum separation of 0.5 inch (12.7mm) as shown in Figure 4-1. If one symbol is on a label, the edge of the label must be located 0.0 to 0.5 inch (12.7mm) beyond the quiet zone (a clear space containing no dark marks, which precedes the start character of a symbol and follows the stops character) of the other symbol. If both symbols are on separate labels, the labels must not overlap and must not be separated by more than 0.5 inch (12.7mm), measured between adjacent edges of labels.

4.4 Human Readable Interpretation of Bar Code Data

The data encoded symbol shall be represented in human readable characters directly above and/or below the bar code symbol. The human readable interpretation shall include the data identifier or application identifier. The human readable interpretation shall be printed in upper case characters. Any human-readable font with characters no less than 0.094 inch (2.39mm) in height is acceptable.

Example:

322 5000	for UCC/EAN Code 128
7Q 5000 FT	for AIM/USS Code 39

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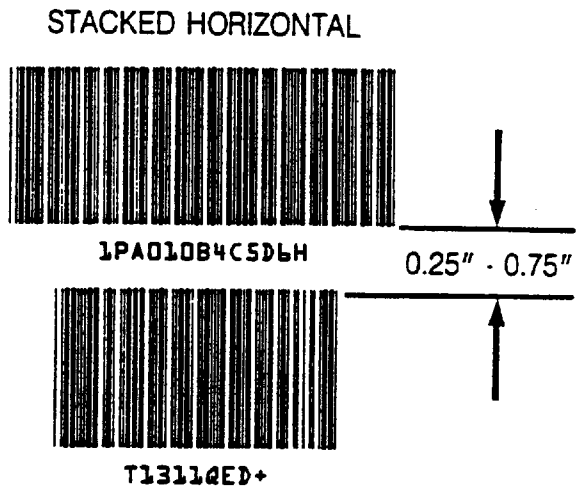

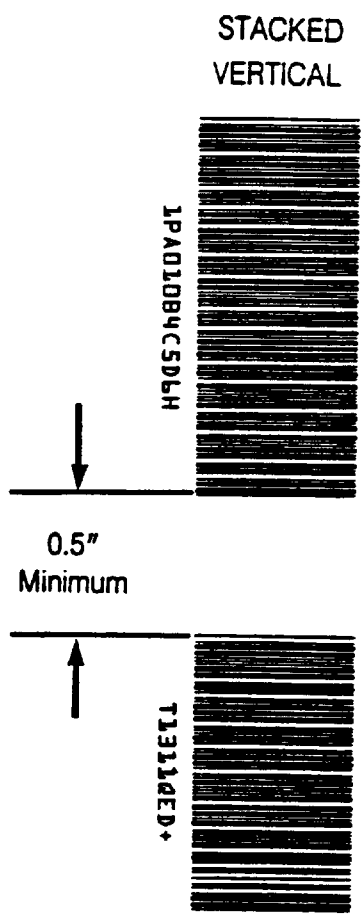

Figure 4-1
STACK BAR CODE FORMAT

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Section 5
BAR CODE LABEL PLACEMENT

5.1 Items Labeled Directly

The bar code symbol shall be placed on the same surface as the human readable product identification so the identification numbers can be read as well as automatically scanned without repositioning the container.

Bar codes shall be printed onto a tag or label that can be attached directly to the container (reel, box, coil, etc.) Tags or labels in use for other purposes shall be permitted to carry the bar code label if enough space is available.

On reels, the bar code label or tag shall be placed on the outside flange as close to the arbor hole (hub) as possible. Additional tags or labels shall be permitted.

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Appendix 1
FACT DATA IDENTIFIERS AND UCC/EAN APPLICATION IDENTIFIERS

The following are Wire and Cable Division interpretations of some Federation of Automated Coding Technologies Data Identifiers (FACT DI) and UCC/EAN Application Identifiers (AI) as they pertain to power and control wire and cable products. (n/e = non-existent).

NOTE—"..." Indicates data located in a two part DI

Application Identifier (UCC/EAN 128)	Data Identifier AIM USS Code 39	Definition	Maximum Field Length
8003	1B	Returnable Reel Serial Number	34
95	2K	Shipment Identification Number (PRO #) Assigned by Supplier	32
401	5K	Release Number for Customer Purchase Order	33
n/e	9K	Customer Marking (Job Number) A number specified by the customer for reference purposes.	15
400	14K	Customer Purchase Order Number plus Line Item Number	33
410	2L	Ship To — Customer Name or Location (Mutually Defined)	Name 35 Adr.1 35 Adr.2 35
91	P	Customer's Part Number	22
240	1P	Supplier's Part Number (Product Number)	30
250	20P	Customer Specification Number. Specification is different than a part number in that utilities may retain a part number while changing a specification. A specification may cover more than one part number.	30
92	30P	Supplier Specification Number	30
30	7Q . . EA	Quantity for Selling and Billing Purposes (includes unit of measure; FT = feet)	10
322	7Q . . FT	Quantity for Selling and Billing Purposes (includes unit of measure; FT = feet)	10
310	7Q . . NK	Net Weight – kilograms	10
311	7Q . . MR	Length – meters	10
316	7Q . . CR	Volume – cubic meters	10
320	7Q . . LB	Net Weight – pounds	10
330	7Q . . GKG	Gross Weight – kilograms	10
340	7Q . . GLB	Gross Weight – pounds	10
93	14Q	(Inner Sequential Marking)	30
94	15Q	(Outer Sequential Marking)	30
21	S	Product Serial Number (Quality Control Number)	20
00	2S	Advanced Shipment Notification A number to identify the shipment	20
96	3S	Serial Number of Reel and Contents	30
10	W	Manufacturer factory/stock Order No. Provides traceability of product back to manufacturing location.	20

NOTE—Application Identifiers should not be used more than once.

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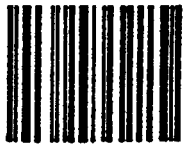
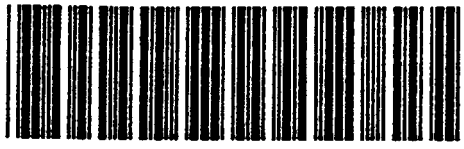
EXAMPLES OF DATA FIELD LAYOUTS UTILIZING UCC/EAN CODE 128 AND AIM USS CODE 39

Manufacturers Identification Number

Manufacturer XYZ has been assigned U.P.C. Manufacturer Identification Number 781234:



781234
UCC/EAN CODE 128



2V 781234
AIM USS CODE 39

Manufacturers Product Identification Number

Manufacturer XYZ (U.P.C. Mfr. No. 781234) assigns item number 22344 to a product:



(240) 22344
UCC/EAN CODE 128

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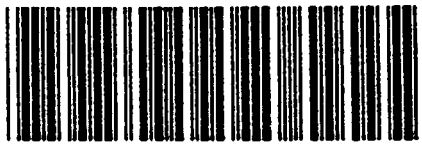
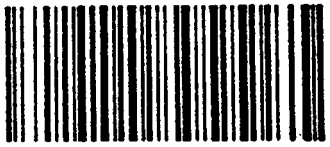


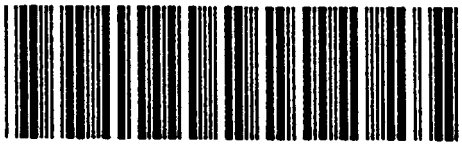
1P 22344
AIM USS Code 39

Quantity

Manufacturer XYZ (U.P.C. Mfg. No. 781234) is identifying a quantity of 500 for U.P.C. Item Number 22344 that is normally sold in feet.



(322) 500
UCC/EAN Code 128



7Q 500 FT
AIM USS Code 39

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Serial Number

Manufacturer XYZ has assigned serial number 56ZV5678 to a reel or other package and its contents.

NOTE—This should not be confused with the serial number for the returnable shipping container.



(21) 56ZV5678
UCC/EAN Code 128



S 56ZV5678
AIM USS Code 39

Purchase Order Number

Reel and contents serial number 56ZV5678 has been shipped against purchase order AB355798:



(400) AB355798
UCC/EAN Code 128

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14K AB355798
AIM USS Code 39

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NEMA STANDARDIZATION BACKGROUND

The purpose of NEMA standards, their classification, and status are set forth in certain clauses of the NEMA *Standardization Policies and Procedures* manual and are referenced below:

Purpose of Standards

National Electrical Manufacturers Association Standards are adopted in the public interest and are designed to eliminate misunderstandings between the manufacturer and the purchaser and to assist the purchaser in selecting and obtaining the proper product for their particular needs. Existence of a National Electrical Manufacturers Association Standard does not in any respect preclude any member or nonmember from manufacturing or selling products not conforming to the standard.

Definition of a Standard

A standard of the National Electrical Manufacturers Association defines a product, process, or procedure with reference to one or more of the following: nomenclature, composition, dimensions, tolerances, safety, operating characteristics, performance, rating, testing, and the service for which they are designed.

(Standardization Policies and Procedures, p. 1)

Dimensions

Where dimensions are given for interchangeability purposes, alternate dimensions satisfying the other provisions of the Standards Publication may be capable of otherwise equivalent performance.

(Standardization Policies and Procedures, p. 6)

Categories of Standards

National Electrical Manufacturers Association Standards are of three classes, which have received the affirmative vote of at least two-thirds of the Subdivision votes cast in the affirmative or negative:

1. NEMA Standard, which relates to a product, process, or procedure commercially standardized and subject to repetitive manufacture.
2. Suggested Standard for Future Design, which may not have been regularly applied to a commercial product, but which suggests a sound engineering approach to future development.
3. Adoptive Standard, which is adopted in whole or in part from the standards of another organization, either domestic, regional, or international.

(Standardization Policies and Procedures, pp. 5)

Authorized Engineering Information

Authorized Engineering Information consists of explanatory data and other engineering information of an informative character not falling within the classification of NEMA Standard or Suggested Standard for Future Design, which standard has received the affirmative vote of at least two-thirds of the Subdivision votes cast in the affirmative or negative.

(Standardization Policies and Procedures, pp. 5)

Identification of Status

Standards in NEMA Standards Publications are identified as "NEMA Standard," "Suggested Standard for Future Design," or "Adoptive Standard." These indicate the status of the standard. A statement incorporating the auxiliary verb "shall" indicates that compliance with a requirement is mandatory for compliance with the standard. These classes of standards are identified in the foreword or throughout the text.

The material identified as "Authorized Engineering Information" is designated similarly. Statements incorporating other auxiliary verbs such as "should," "may," etc. refer to the authorized engineering information and not to procedures required for compliance with the standard.

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MEMBER COMPANIES

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Toronto, Canada

Alcan Cable
Atlanta, GA

Amercable
El Dorado, AR

American Insulated Wire Corporation
Pawtucket, RI

BICC Cables Corporation
West Nyack, NY

BICC Industrial Cable Company
York, PA

Carol Cable Company, Inc.
Highland Heights, KY

Furon Company
Dekoron Division
Aurora, OH

Hendrix Wire & Cable
Milford, NH

The Kerite Company
Seymour, CT

The Okonite Company
Ramsey, NJ

Pirelli Cables North America
Lexington, SC

The Rockbestos Company
East Granby, CT

Rome Cable Corporation
Rome, NY

Tamaqua Cable Products Corporation
Schuylkill Haven, PA

Triangle Wire & Cable, Inc.
Lincoln, RI

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